Susan Wilson

Homework 2

Problem 1:

a. CMPT333 - Variable

b. cmpt333 - Constant

c. 333 - Constant

d. "cmpt333" - Constant

e. p(X, ~~x~~) - nonground Atomic formula

f. p(3,4,5) - ground atomic formula

g. "p(3,4,5)" - Constant

Problem 2:

What grade did L. Van. Pelt get in "Cmpt 220"?

C: "Cmpt 220"
N: "L. Van Pelt"

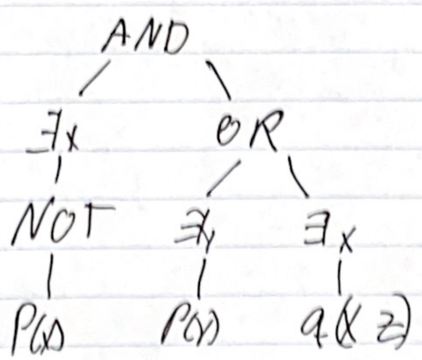
CSG("Cmpt220", S, G) AND SNAP(S, "L.VanPelt", A, P) → answer(G)

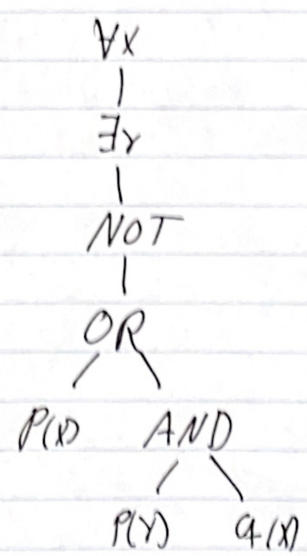
Problem 3:

a. $(\forall x)(\exists y)$ NOT (P(x) OR P(y) AND q(x))

b. $(\exists x)$ NOT P(x) AND (($\exists y$) P(y) OR ($\exists x$) q(x, z))

Problem 4:





Problem 5:

$(\exists x)$ NOT $P(x)$ AND $((\exists y)P(y)$ OR $(\exists x)\, Q(x,z))$

Problem 6:

C. Brown is an A Student

N: "C. Brown"
G: "A"

Problem 7:

a. $(\forall x)(\exists y)(loves(x, y))$

D: a, b, c

True	False
loves(a, b)	loves(a, b)
loves(c, b)	loves(c, b)
loves(b, a)	

b. $P(x) \rightarrow NOT\ P(x)$

$\boxed{\begin{array}{l} P(x): False \\ P(x): True \end{array}}$ - makes the expression true
- makes the expression false

c. $(\exists x)\ P(x) \rightarrow (\forall x)\ P(x)$

P(x): a   P(a) is true

P(a, b): $P(a) \rightarrow (\forall x) P(b)$ is false

d.

D: a, b, c
P(x, y) = true if ab, bc, ac

D: a, b, c
P(x, y) = false if cb

Problem 8:

a. Tautology due to commutative property

$$P(x) \text{ OR } q(x) \equiv q(x) \text{ OR } P(x)$$

b. Tautology due to Reflexivity of equivalence

c. If $p(x) \to$ true ~~then~~ is equivalent to $P(x)$ then $P(x) \to$ false is equivalent to NOT $P(x)$ via Implication of AND and OR.

Problem 9:

a. $(\forall x)(P(x) \text{ AND } (\exists y)P(y)) \text{ OR } (\exists x)\, q(x, z)))$?

$- \boxed{(\exists x)(\text{NOT}(P x)) \text{ AND } ((\exists x)P(x)) \text{ OR } ((\exists A)\, q(A, z)))}$

b $\boxed{(\exists x)(\exists y)\, P(y) \text{ OR } (\exists z)\, q(z) \text{ OR } r(x))}$

Problem 10:

~~$P(x, y)$ AND $(\forall x)$~~ $\boxed{a. (\forall x)\, P(x, y) \text{ AND } (\exists y)\, q(y)}$

~~b. $(\exists x)(P(x, y)$~~

b. $\exists x (\forall y)(P(x, y) \text{ OR } (\exists z)(\forall g)\, P(g, z))$

Problem 11:

No, the law does not allow us to change the quantifier location.

The $(\exists x)\, q(x)$ will not be ~~changed~~ to $\exists x\, P(x, y)$ ~~and~~ because the quantifier is the same

Problem 12:

a. ~~$\forall x\, P(x)$ AND $(\exists y) P(y)$ OR $(\exists x)$~~ $q(x, z)$

~~$(\exists A)(\exists x)(\exists y)$ $(P(x)$ AND $(P(y)$ OR $q(A, z)))$~~

~~Not (\forall x)~~

$\boxed{\text{NOT } (\forall x)(\exists y)(\exists A)\ (P(x) \text{ and } P(y) \text{ or } q(A, z))}$

~~b. Not $\forall x$~~

b. ~~$(\exists x)(\exists z)\ P(x)$ OR~~

$(\exists x)(\exists z)(\exists A)\ P(x)$ OR $Q(A)$ OR $r(A)$

Problem 13:

Quantifiers moving through the $\rightarrow$ operator translate from $(\forall x)$ to $(\exists x)$ and vice versa, the other side is also negated once a quantifier is moved

With respect to the example, there are no quantifiers

The ~~constant~~ constants is need to ~~be~~ be negated

Problem 14:

1. $NOT((\exists x)(\exists y)\, P(x,y))$

$\forall x\ \forall y\ NOT\ P(x,y)$

2. $NOT(((\exists x)\, P(x)\ OR\ (\exists y)\, Q(x,y))$

$\forall x\ \forall y\ NOT\ P(x)\ OR\ Q(A,y)$

Problem 15:

no, $(\exists x)E$ means there exists an X meaning there will be an ~~instance~~ instance of $(\exists x)$ where $\exists$ is not a tautology
instance